UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**
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EROSION CONTROL PRACTICES DIVISION

Winter Cover Crop Management - C. S. Britt, Beltsville, Maryland.-"Yield and value data have been completed on the cover crop plots for the 1950 season. Most of this tobacco was grown with 10 inches of rainfall and 8.35 inches of this rain came during the first 35 growing days. The yields and values are given in table 1.

Table 1.--Winter cover crop management in relation to yield and value 1950 crop season, Beltsville, Md.

Covers	Yield/Acre		Price/Pound		Value/Acre	
	Early* plowing	Late* plowing	Early plowing	Late plowing	Early plowing	Late plowing
No cover	667	721	40.2	41.2	268	297
Ryegrass	814	868	40.2	39.9	327	346
Vetch	842	1,212	42.6	38.6	359	468
Wheat-Vetch	965	1,221	42.1	44.0	406	537
Rye-Vetch	1,090	1,181	43.4	43.6	473	515
Ryegrass-Vetch	1,076	1,328	44.1	45.3	475	602
Average three Mixtures	1,044	1,243	43.2	44.3	451	551

*Early plowing - April 21, 1950
Late plowing - May 22, 1950

"These plots were started in the fall of 1944 with the planting of the covers and have been in continuous tobacco since that time. Important differences may be summarized as follows:

1. Ryegrass alone gave comparatively higher yields compared to no cover than in any previous season.

2. Late plowing of the ryegrass has usually caused a reduction in tobacco yield. This trend was reversed during the 1950 season.

3. Vetch alone greatly increased the crop yield when turned late, however, the quality of the tobacco was poor. This is in line with past performance of this cover.

4. Vetch grown in mixtures with wheat, rye or ryegrass gave heavy yields of high quality tobacco. Late plowing of the mixtures gave increased yields of higher quality tobacco."

Winter Wheat Management Plots - F. H. Siddoway, St. Anthony, Idaho.- "Winter wheat yields in the area were generally lower this year than average. The rainfall for May, June, and July was approximately 4 inches below normal and if the moisture in the fallow from the preceding year had not been exceptionally good, the spring drought would have reduced yields considerably. Winter wheat yields in the lower areas where the crop matured earlier were not reduced to the extent the higher areas were.

"The winter wheat management plots this year showed small differences between treatments. Some of the differences are interesting, however, when the spring drought is considered. Last year the average for the straw utilized plots was 2 bushels below the straw burned plots. This reduction in yield was felt to be a result of the cold, wet spring and the consequent hindrance of nitrate production in the surface soil. This year, as shown in the table below, the trend of higher yields for the stubble utilized plots continues.

Table 1.--Average yields of winter wheat in bushels per acre from various crop residue and tillage treatments 1951

Type of plow	Stubble treatments		
	Stubble utilized	Stubble burned	Average
Moldboard	21.9	22.0	21.9
Sub-surface plow	21.1	20.8	20.9
Oneway disk	23.4	19.8	21.6
Average	22.1	20.9	
Oneway disk			
75# Ammonium Sulfate	20.5		
2000# straw	20.7		
4000# straw	20.3		
Moldboard fall plow	21.5		

"Under the dry conditions that prevailed during the growing season the available nitrates were not fixed to any appreciable extent in the breakdown of straw residues. The small difference in yield would most logically be accounted for by the additional moisture retained by the straw utilized plots.

"The stand was reduced somewhat on some of the sub-surface plowed plots by winter kill. This was not consistent though throughout all plots and seemed to be a matter of location rather than method of plowing. The 75-pound Ammonium Sulfate plots again failed to show an increase over the other treatments.

"As this experiment continues, it further bears out the fact that yields from different methods of tillage and management depend largely on the climatic environment."

Kudzu Insect Pest - J. Vicente-Chandler, Rio Piedras, Puerto Rico.-"What appears to be an important insect pest of Kudzu has made its appearance in a 12-acre field at Vega Alta. About 25 percent of the leaf surface of the Kudzu has been destroyed in this field. Mr. Mario Perez, Assistant Entomologist of the Insular Experiment Station has made a detailed study of the area at our request and informs us that the main culprit is a chrysomelid beetle-Cerotoma ruficornis Olivier. A pyralid moth-Lamprosema indicata also seems to be causing some damage in that region. It is interesting to note that the Kudzu growing with grasses on a small hill in the center of the field was undamaged. It appears that either unfavorable moisture conditions or its association with grasses have made the Kudzu less palatable. No appreciable damage to Kudzu has been noted on other parts of the island, although both the above mentioned insects are widely distributed. They seem to be less abundant in the high, central part of the island and we hope this may indicate that major damage to Kudzu will be limited to the coastal areas."

Sugar Cane Yields - J. Vicente-Chandler, Rio Piedras, Puerto Rico.-"The yields of eight sugar cane fields at Aguirre at two moisture and two nitrogen levels have been analyzed statistically. No significant differences were found for any of the treatments. Approximately five irrigations less were applied to the fields with dry treatments. The data are being studied carefully in an attempt to interpret the results correctly. The effect of moisture seems to confirm our previous findings but the lack of response to increased nitrogen applications was a surprise. It would seem that some factor such as damage by grubs might be overshadowing the results, or that nitrogen losses as ammonia are considerable when large applications of ammonium sulphate are made near the surface on relatively alkaline soils such as those at Aguirre. High temperatures would also seem to increase their losses. Leaching losses would appear to be of less importance as there is no indication of response to nitrogen either on wet or dry treatments and losses of that type would be expected to be greater at the former moisture level."

Installation of Equipment - F. W. Schaller, Ames, Iowa.-"Most of the time of the project staff at Ames during July and August was spent on the installation of runoff equipment on the new sites located at Beaconsfield, Corydon, and Independence. The equipment is now completely installed at Independence and the first runoff was recorded on August 8. The data from this runoff indicated that the equipment is working in first-rate order. Five tipping buckets have been installed on the plots at Beaconsfield. Observations from one runoff-producing storm indicated that adjustments are still needed for the proper operation of the tipping buckets. At Corydon the installation of equipment is nearly completed, however, it is not planned to obtain runoff data until next year.

"A continuous silt sampler was installed in one of the Little Sioux flood control structures in the Theobold watershed during June. A storm in July gave an excellent opportunity to check the operation of this sampler. Results were very encouraging, however, there was a tendency for weed seeds and very fine pieces of organic material to plug the slot device which samples the runoff waters. There was also some tendency for silt to accumulate on the 1-foot water wheel which is used for further reduction of the sample collected. Steps have been taken to correct these conditions and it is hoped further observations will be obtained this year."

Mulch Planter Experiment at Clarinda - F. W. Schaller, Ames, Iowa.-"Detailed notes on the mulch planter experiment at Clarinda were made during early August. The growth of corn planted with the mulch planter appears at this stage to compare very favorably in development with that planted with the conventional plowing method. However, there appears to be greater variation in stands where the mulch planter was used."

Recording Rain Gage Method for Obtaining a Constant Record - H. A. Daniel, Guthrie, Oklahoma.-"Maurice B. Cox has worked with Louis E. Derr and Elmo Baumann, Soil Scientists of SCS Operations, on the Wheatland Conservation Experiment Station, Cherokee, Okla., and developed a method of using a recording rain gage to obtain a constant record of the infiltration rate of water into soil by the concentric ring method. This method consists of siphoning the water from a filled rain gage into the center ring. The water for the outer ring is supplied by an auxillary tank. The water level in the two rings are maintained at a constant level with floats from discarded automobile carburetors. As the water in the inner ring infiltrates into the soil a record of the rate is recorded on the chart of the rain gage. An 8-inch center ring is used to conform with the capacities of a standardized recording rain gage. This machine is being used to determine the infiltration rate of the soil on this Station."

Conservation Practices Withstand Severe Test - O. E. Hays, LaCrosse, Wisconsin.-"On July 21, a very severe storm struck Vernon County near the old Coon Creek project. The Weather Bureau reported 8.32 inches of precipitation at Viroqua. Unfortunately, no intensity records are available. Local residents contacted, however, were of the opinion that most of the rain fell within a 2-hour period.

"This storm provided an excellent opportunity to study the effectiveness of long-established conservation practices. Mr. Neu and I spent a day measuring soil loss by rill measurement. It was quite apparent that where strip cropping and terracing were used with a good rotation the soil loss was relatively low on ridge land. Most valley land was gutted or covered with sediment.

"Our observations indicated that there was a relationship between slope of corn row and soil loss. Two farms were selected on which detailed measurements were made to determine rill area as apparently influenced by row gradient. The data obtained are included in the following table. Measurements of rill area and row slope were made by 100-foot intervals.

Table 1.--Rilling in corn strips, Viroqua area - rain of July 21, 1951

	Percent slope of row								
	Level	0.5	1.0	1.5	2.0	3.0	4.0	4.5	5.0
	Rill Area - Square Inches per 100 foot								
Krause Farm									
1st strip			0.0	0.0*		0.0*			
126' wide									
10% slope									
3d strip	748.5		169.0		0.0*				
75' wide			0.0*						
15% slope									
5th strip	267.0		0.0		180.5*				
63' wide			683.8						
16% slope			283.5						
			426.5						
Dregne Farm					0.0*				
Strip 2	64.5		0.0	13.5	0.0*				
84' wide	0.0				96.0*				
9% slope					0.0				
Strip 4		0.0	137.0	125.5		0.0		0.0*	0.0*
78' wide			51.0						
14% slope			88.5						

*Scouring occurred in the corn row.

"The highest soil loss occurred on level rows; the least soil loss occurred on rows of 1.5 percent gradient. Where the gradient exceeded 2 percent there was no overtopping but there was considerable scouring. However, the scouring in the row did not remove as much soil as the rilling across rows. For the storm, crop, and soil conditions studied, it was apparent that the least soil was lost on rows with gradients of 1.5 to 2 percent. It is planned that studies will be conducted at the La Crosse Station to determine if graded rows are more effective than level rows."

Chemical Fallow - T. S. Aasheim, Havre, Montana.-"Plots in this project were harvested. The yields obtained from the various treatments and the test weight per bushel of the grain produced is given in the following table:

Table 1.--Bushels of wheat per acre and test weight of wheat produced in the chemical fallow project at the North Montana Branch Station during 1951. Average of triplicated plots.

Fallow treatment	Bu. wheat per acre	Test wt. per bu.
Subtill after harvest & subtill	21.4	57.1
Spray after harvest & subtill	22.6	57.3
Spray after harvest & spray	15.4	57.8
Spray	16.6	57.9
Spray & spray after seeding	15.9	56.6
Plow & spray	23.0	56.8
Subtill & spray	22.4	57.2
Spray & subtill	20.2	56.9
Spray & subtill & spray after seeding	22.2	55.7
Idle	6.4	57.4
Subtilled	22.0	57.1

"Results indicate that spraying for control of weeds on fallow is much superior to no weed control at all, but that spraying alone does not result in a yield of grain equal to that where tillage is used alone or in combination with sprays. It was expected that the yield on sprayed fallow would not be as good as on cultivated fallow because there was a lot of volunteer grain on the sprayed fallow last year and weed control was not too good. As in the past 2 years, a combination of tillage and sprays resulted in yields comparable with treatments where tillage was used entirely.

"This year one local farmer used his private plane to spray a large portion of his fallow rather than cultivate it. His spray application took the place of his usual second fallow cultivation. He was pleased with his results.

"It seems probable that in the future spraying may be used to a large extent in controlling weeds on fallow. The extent to which the practice is used will probably depend on the comparative cost more than any other single factor. Experimental results to date do not indicate that tillage can be eliminated, but that the number of tillage operations can be reduced without reducing crop yield."

Interrelationships of Conservation Rotations and Supplemental Irrigation.-O. R. Neal, New Brunswick, New Jersey.-"A series of plots was started in 1949 to study the interrelationships of conservation rotations and supplemental irrigation. Sweet corn is grown under conditions of continuous cultivation and in a 3-year rotation including 2 years of corn and 1 year of a clover-grass sod mixture. All treatments appear in each of four blocks, two of which are irrigated as required. Water is

added when moisture tension at a 6-inch depth reaches 20 inches of Hg. Four applications of water of about 1.5 surface inches each were made during the 1951 season. Corn yields are shown in table 1:

Table 1.--The influence of conservation cropping systems and of supplemental irrigation on sweet corn yields, Vegetable Research Farm - 1951

Treatment	Yield - No. 1 ears/A.	
	Irrigated	Unirrigated
Continuous cultivation	9,700	12,000
2nd year of corn following sod	11,700	13,600
1st year of corn following sod	10,700	14,300

"The rainfall during the 1951 growing season was quite favorable for crop growth. No really serious dry periods occurred. The significantly reduced yields under irrigation indicate the need of further study on amounts and frequency of application. There appears to be a definite detrimental effect on the physical condition of the soil due to irrigation. The soil remained moist and compact for a long period in the fall and there was still a pronounced difference between the irrigated and unirrigated plots at time of plowing in the spring. The irrigated plots seemed more sticky and resistant to tillage operations."

Sand Bar Deposits - A. W. Zingg, Manhattan, Kansas.-"Limited studies of sand bar deposits on the flood lands along the Kansas River were made during the month. Many sand bars from 1 to 200 feet in width and several hundred feet long have been deposited on the flood-plain. While their composition varies widely, mechanical analysis has shown that they contain in the neighborhood of 90 percent sand In general, this sand contains some material finer than found in dune sands. The sand bars are very low in organic matter, one sample showing 0.05 percent. Continued wet weather is making it very difficult to get vegetal cover back on the area. If the sand bars go through the winter in a bare condition they are almost certain to be a dust and sand storm hazard next spring."

Limed and Shattered Plots - D. D. Smith, Columbia, Missouri.-"Wheat on the deeply limed and shattered plots averaged 31.5 bushels per acre this year. This was 4.2 bushels per acre more than for the shattered plots without the deep treatment, but only 0.9 bushel more than for the check plots. There was a much wider variation in individual plot yields for the six check plots than for the deeply limed and shattered plots."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Rainfall of 0.55 inch for the month was the least of any August for a 50-year period. There was no surface runoff. Stream flow was entirely from ground-water sources and even that stopped at almost all stations soon after the middle of August. Many springs, normally supplying water throughout the year, had ceased by the end of the month. Some farmers are hauling water for livestock.

"Mr. Dreibelbis reports that soil moisture was lower than at any previous time since records were started. Observations made on August 24, in corn watershed No. 111 show the following:

Soil depth	Soil moisture
0-3 inches	4.3 percent by volume
3-7	8.0
7-10	11.8

"Soil moisture in this mulch watershed before August was greater than in plowed watershed No. 113. By mid-August there was no noticeable difference between the two. Although wilting point had been reached on both areas, it is of interest to note that it was reached later on the mulch area.

"In view of the severe lack of rainfall it was striking to see how long the vegetation withstood the drought. On many mornings during the month there were more than just noticeable amounts of dew on the vegetation and in the soil surface. Condensation and absorption for August totaled 1.16 inches - more than double the recorded rainfall. This is the greatest value of August condensation yet recorded in the lysimeter observations. It is about double the average of 0.57 inch. As the alfalfa plants on the lysimeter probably transpired some water, these condensation values represent only the net weight increase. Therefore, the actual condensation was probably greater than the recorded value of 1.16 inches.

"An effort was made to determine the magnitude of the condensation and absorption on bare soil by use of the Coshocton Fiberglas Gypsum Blocks. Measurements on these blocks placed in the soil at 1/2 to 1 inch below the land surface show the following:

Date	Time	Inches of water per inch of soil	Remarks
Aug. 23	8 p.m.	0.073	
24	6 a.m.	.133	
Gain		.060	Heavy dew
Aug. 24	7 p.m.	0.048	
25	6 a.m.	.123	
Gain		.075	Heavy dew
Aug. 27	7 p.m.	0.082	
28	6 a.m.	.115	Light dew
Gain		.033	

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"One of the worst drought and heat periods on record has continued through August. During the month there were 24 days with a maximum temperature greater than 100 degrees F. The average daily maximum was 101.3 degrees F. and the highest recorded was 106 degrees F. The total rainfall for the month was 0.11 inch and the accumulated deficiency from normal since October 1950, was 13.73 inches.

"Corn yields are fair, oat yields were small, grain sorghums matured about one-half a normal crop, pastures are dormant and cotton has opened prematurely due to the heat and dry weather. Fields of cotton that have been harvested are producing about 1/3 bale per acre on areas where conservation practices have been observed for a number of years. Areas with ordinary farm practices are yielding somewhat less but the difference is smaller than usual. Soil moisture has been the dominate factor on cotton yields and with the light rainfall since September 1950 there has been no opportunity to save any appreciable moisture by conservation practices.

"The hot dry weather this season evidently reduced to a minimum root rot damage. Fields in both Y and W Areas showed considerably less damage from cotton root rot this year than the same fields did in 1949. The 2-year system of cotton and Hubam clover in 1949 has 14 percent dead plants. The same field this season with cotton following Hubam had only 3 percent of dead plants. The percentage of dead cotton plants in the Y Area this season on which conservation farming practices are in effect was 5.4 percent in comparison to 15.9 percent on the W Area where conventional farming practices are still in effect.

"At the end of the month the water-supply situation was critical. Many farmers in the area are hauling water for livestock. The project water-supply lake is at its lowest level since filled in 1938 and without some relief cannot continue to furnish water for more than 30 days."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"In August 3.53 inches of preceipitation was measured at the Meteorological Station. The rains were well distributed over the month with 1.21 inches measured on August 3, 0.86 inch on August 14, and 0.87 inch on August 26, with other lesser amounts on other dates.

"With the exception of January 1951 which showed a deficit of only 0.08 inch of precipitation all other months in 1951 have shown above normal rainfall. At the end of August we were approximately 12.0 inches above normal with a total rainfall of 30.25 inches so far in 1951.

"Visual observation of the cornfields in this section show several conditions: (1) The color indicates a lack of nitrogen especially on the eroded slopes, (2) there is a poor stand due to washing where the fields have been planted up and down the hill, and (3) root worm is severe in fields which have not been rotated.

"All of these conditions have been avoided on fields where recommended conservation practices have been followed.

"The runoff records have been completed and tabulated for the period June 1 to July 12, 1951, inclusive, for Watershed W-5, containing 411 acres and approximately 65 percent treated and on Watershed W-3, containing 481 acres and untreated. The following comparison is made:

Table 1.--Rainfall and runoff data, Watersheds W-3 and W-5, Central Great Plains Experimental Watershed, June 1 to July 12, 1951, incl.

Period June 1 - July 12, 1951	Watershed W-5 approx. 65% treated 411 acres	Watershed W-3 untreated 481 acres
Total weighted rainfall	15.66 inches	14.75 inches
Total runoff	6.39 inches	7.32 inches
Rainfall minus runoff	9.27 inches	7.43 inches
Percent runoff	40.8 percent	49.6 percent
Peak rates of runoff - June 1	.93 in./hr.	1.3 in./hr.
Peak rates of runoff - July 10	.87 in./hr.	1.7 in./hr.

"In summarizing the data for the period June 1 to July 12, 1951; Watershed W-5 received 0.91 inch more rain than Watershed W-3, yet the total runoff from Watershed W-5 was 0.93 inch less than Watershed W-3. By a comparison of rainfall minus runoff 1.84 inches more rainfall was retained on Watershed W-5 than on W-3."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"July rainfall was significantly above 'normal,' and August significantly below. The accumulation for the year has been within the 'normal' range since April. Heavy rainfall (exceeding 1/2 inch in 24 hours) occurred on July 3, 9, and 27 and on August 6. The July 9 rainfall totaled approximately 2.2 inches, following more than 0.3 the preceding day.

"Important runoff occurred from watersheds in soybeans on July 3 (see subsequent discussion of effects of cultivation) and the July 9 storm produced generally heavy runoff, for which the data are summarized in table 1.

"Mr. Stoltenberg prepared the following analysis, comparing soil and water losses from a pair of similar watersheds in soybeans under prevailing treatment, for three successive runoff periods, for which data are given in table 2:

"The plan is to cultivate all watersheds under comparative treatment and all replicate watersheds at the same time. Occasionally, however, circumstances preclude carrying out this plan. Should runoff occur during such time as the watersheds are not in the same stage of cultivation the data obtained will be biased with respect to the design of the experiment but may nevertheless furnish valuable information.

"Watersheds 5 and 8 are adjacent and hydrologically very similar as evidenced by the runoff of 0.43 inch and 0.41 inch, respectively, on June 17, 1951. The higher concentration of total solids in the runoff from watershed 8 on June 17 is typical of past results and reflects the greater erodibility of this watershed.

"Watershed 5 was cultivated July 3 but cultivation could not be started on watershed 8 due to rain. This rain caused only a trace of runoff from watershed 5 (cultivated) but caused 0.16 inch runoff from watershed 8 (not cultivated). Cultivation with sweeps developed ridges which increased depression storage about 0.06 inch. The balance of the 0.16 inch or 0.10 inch must be accounted for by increased infiltration as a result of the cultivation.

Table 1.--Runoff from experimental watersheds, July 9, 1951, Purdue-Throckmorton Farm, Lafayette, Ind.

Crop	Treatment*	Wsd. No.	Rainfall		Runoff	
			Total inches	In./hr. 10 min.	Total inches	Peak rate in./hr.
Corn	Prevailing	4	2.15	2.97	0.75	2.54 P
		12	2.24	2.70	1.12	1.76 P
		Mean			.94	2.15
	Conservation	2	2.15	2.97	.01	.03
		11	2.24	2.70	.04	.04
		Mean			.02	.04
	Average treatment difference				.92	2.11
Soy Beans	Prevailing	5	2.21	2.95	1.06	2.27 P
		8	2.26	2.88	1.24	2.66 P
		Mean			1.15	2.46
	Conservation	6	2.21	2.95	.46	.52
		7	2.26	2.88	.83	1.79 P
		Mean			.64	1.16
	Average treatment difference				.51	1.30
Wheat	Prevailing	10	2.24	2.70	.44	.54
		15	2.19	2.64	.14	.25
		Mean			.29	.40
	Conservation	18	2.15	2.57	.04	.09
		14	2.19	2.64	.01	.04
		Mean			.02	.06
	Average treatment difference				.27	.34

*Prevailing System - straight row seeding and cultivation, common fertilization practices; conservation system - contour seeding and cultivation, increased fertilization, deep-rooted legumes, increased organic residues returned to the soil.

PCorrected for pondage above measuring flume.

Table 2.--The effect of cultivation on runoff and erosion from two hydrologically similar watersheds

	Watershed No.	Runoff, inches	Erosion	
			Concentration, lbs./Acre-inch	Total lbs./Acre
Rain of 6-17-51, 1.13"	5	0.43	3,255	1,400
	8	.41	3,877	1,590
Rain of 7-3-51, 0.88"	5	Trace	-	-
	8	.16	1,895	303
Rain of 7-9-51 2.21"	5	1.06	3,094	3,280
	8	1.24	2,684	3,328

"Watershed 8 was still uncultivated when the rain of July 9 fell. Infiltration was as much as 0.19 inch per hour greater on the cultivated watershed in the early stages of runoff, but surface sealing and the increasing soil-moisture differential both tended to counteract the effect of cultivation. In the latter stages of runoff during the lower rainfall rates the infiltration behavior of the two watersheds was equalized and finally reversed due to the greater importance of the soil-moisture content in controlling the infiltration rates.

"The rain of July 9 also furnishes a measure of the effect of cultivation on the erodibility of the two watersheds. Even after several intervening rains, the effect of cultivation has been to increase the erodibility as indicated by the comparative concentrations between the rains of June 17 and July 9. By simple ratio, the erodibility of watershed 5 appears to have been increased about 37 percent. This value would probably be greater for a storm of shorter duration or if there were no intervening rains. Despite this increased erodibility, the reduction in runoff has compensated so that the total loss for the July 9 storm is almost the same for both watersheds."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Fennimore for the month totaled 11.56 inches as compared with a normal of 3.5 inches. The total precipitation for 1951 through August was 36.8 inches which compares with a normal of 22.7 inches. Temperatures varied from a maximum of 83 degrees on the 28th to a minimum of 48 degrees on the 23d with a mean for the month of 65 degrees or about 5 degrees below normal.

"Over 7 inches of the August total occurred in a 4-hour period on the night of August 5 and 6 and as a result of this storm, new peak rates of runoff were established on the 171- and 330-acre areas which were about 50 percent higher than any peaks in the 14 years of record. Peak rates on this flood were considerably above those established by approximately the same total precipitation in a 6-hour period on July 15, 1950, but the total runoff on the more recent storm was one-third less, which is apparently the result of the later date and better ground cover. Good growing weather and ample precipitation during the spring and early summer resulted in excellent stands of hay, pasture, and new seedings, which no doubt considerably reduced the runoff for this storm. Another factor was that the precipitation during the previous 4 weeks was only 1.4 inches.

"Data for the storm of August 5 and 6 is given in the table below: It should be noted from this table that retention was considerably higher on the 52.5-acre area than on the others even though 25 percent of the area was in grain and only 3 percent in corn. The results of this storm confirmed previous observations that small grain with a good stand of new seeding will retain as much or more of the intense precipitation than good legume pasture from mid July to late fall.

"An attempt was made to estimate maximum rates of runoff on other areas in the vicinity from high water marks along a uniform section of channel or above erosion control structures. Computed peak rates of discharge on areas investigated in this manner were:

135 acres, 320 cubic feet per second
9,000 acres, 11,000 dubic feet per second
27,000 acres, 24,500 cubic feet per second

"Erosion was not as high as might be expected from a storm of this type, probably due to the fact that the corn was approximately 7 feet high and had a heavy growth of weeds. The principal damage was to highways and bridges in the area. A

considerable number of bridges were investigated but none were found sufficiently large to carry the entire flood flow."

Table 1.--Precipitation, runoff, and crop cover for the storm of August 5-6, 1951 on the Fennimore, Wis., watersheds

Station	Drainage area acres	Crop cover Percent of area				Peak discharge		Precipitation	Runoff	Retention
		Corn	Small grain	Hay Pasture	Other	C.F.S.	In./Hr.	Inches	Inches	Inches
W-I	330	21.4	12.2	60.9	5.5	565	1.69	7.13	1.85	5.28
W-II	22.8			100		49	2.14	7.09	1.78	5.31
W-III	52.5	3.4	25.6	63.7	7.3	74	1.40	7.22	1.44	5.78
W-IV	171	28.0	13.5	52.8	5.7	304	1.76	6.92	1.72	5.20

Table 2.--Maximum amounts of precipitation, Station R-6

Time - minutes	10	20	30	60	120	240
Amount - inches	.68	1.35	1.89	3.36	5.25	7.09
Intensity In./hr.	4.08	4.05	3.78	3.36	2.63	1.77

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"Mr. Blaisdell spent the entire month analyzing pipe drop inlet spillway data in an attempt to determine equations for the flow over the crest of the drop inlet. The previously obtained data on the drop inlets square in plan were completed and computations were begun on the circular drop-inlet data. None of these computations has yet been checked. Present indications are that the St. Anthony Falls Hydraulic Laboratory Technical Paper No. 8 entitled 'Hydraulic Design of the Box Inlet Drop Spillway' can be used to determine the flow over drop inlets square in plan up to the point where the barrel begins to flow full at intervals and creates suction in the drop inlet. Above this point the flows computed using Technical Paper No. 8 are less than actually occur. In other words, for any given flow the heads computed using Technical Paper No. I are less than will actually occur and are therefore on the safe side."

Supplemental Irrigation in Virginia Agricultural Production - T. W. Edminster, Blacksburg, Virginia.-"The rainfall for the month was approximately 2.09 inches. The pasture irrigation system has been under steady operation for the past 3 weeks. The fourth application of 1.5 inches has been completed and eight settings on the fifth application. At present the carrying capacity of the irrigated lots is double that of the check lots and if the drought continues for 2 weeks the check plots will be unable to support continuous grazing. Due to the drought conditions watering tanks were placed in each lot being filled from the irrigation main.

"The ladino areas in each lot have been seeded and only a small amount of seed has germinated to date.

"On the control plots the burley tobacco has been harvested and the green stalk weight indicates a decided increase in favor of irrigation. The third cutting of alfalfa was made on August 14 and two applications of 1.2 inches of water have been applied to the stubble.

"The corn plots also received two applications of 1.2 inches of water."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"At the Everglades Experiment Station, observations were continued on the six concrete tanks which were planted with kenaf on July 20, 1951. As of the end of August, the crop averaged 3.5 feet in height. There is considerable variation in plant height and density in the test area, and soil samples will be analyzed for chemical constituents which may be causing this growth variation."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Rainfall during the period was very irregular across the area, varying from 2.34 inches at the Cooper Grove (Silver Palm and Farm Life Road) to 11.98 inches on West Mowry. The heaviest rains occurred along the western edge of the area with the lighter rains beginning about the center and extending northeastward toward Miami.

"Moisture readings on the mulch plots from the 1st to the 14th showed low readings. From the middle to the end of the month with light infrequent showers, readings for the natural cover plot increased more rapidly than the check plot. This can be accounted for by the fact that there is a heavy growth of native grasses which is probably using water very rapidly at this time of the year. For the pine straw and grass mulch and shavings areas readings increased slightly.

"Samples collected for nitrate analysis from the plots showed the natural cover, shavings, and check areas remained low, 2 to 3 parts per million. Both the pine straw and grass mulched plots had increased considerably running 60 to 70 ppm.

"Moisture readings in the Sunland Grove Plots area from August 1 to the 14th remained quite low. From August 15 to the end of the period only 0.93 inch of rain was recorded in this area. With the low rainfall and of course rapid growth of the trees there was a very rapid decline in available moisture and all the plots showed that the soil was near the wilting point. It was recommended that water be applied to the area by irrigation.

"Samples collected during the early part of the period in connection with the leadhing studies showed that some nitrogen was lost during this period. All of the areas sampled showed a comparatively low level. During the end of the period with only light occasional showers the level on those plot areas on which the higher organics were used built back somewhat. Block3 on which the Nitrea material is being used built up from 13 to 66 ppm. In those areas where more readily available types of nitrogen were used the build-up was not as great."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-"Grading work was completed the last of August on the 65-acre test area at Cinclare Plantation. We contemplate using this particular area for further studies on grading work and along with it some studies on draw down and like information on drainage ditches, since the area is close to the highway and can be reached in bad weather. Part of the area is to be planted flat and experimental work carried on which has been trie on a limited scale for the last 2 years. All indications are that the test areas which were worked last year and are in cane this year have withstood the drought much better than the check areas and other cane fields. The one area that was planted and cultivated on the flat seems to have approximately the same growth as cane which is up on rows.

"The two test areas on St. Delphine Plantation of approximately 80 acres seem to indicate that it is probably the best cane on the plantation. Of course, when this cane is cut during the coming grinding season we will have more information."

Drainage Studies - E. G. Diseker, Raleigh, North Carolina.-"It has not been necessary to apply chemicals to the vegetation in the McRae canal since last November, at which time 4 ounces of extrone number 44 per 4 gallons of water was applied. The plants, Pennywort and Pease Loose Strife did not reappear this year. Only an occasional sprig of the Burr Reed was observed this summer. This plant previously covered the canal and caused considerable damage. The greatest number of plants found amounted to from 1 to 3 plants in about 600 yards. It is believed that they were not killed when the spray was applied in the fall since there were a number of small plants under water and these did not come in contact with the spray. The canal bottom is now a uniform slope and no pools or sediment deposits are present as a result of the Burr reeds. It was observed that cattails are becoming numerous in the cross or headland canals which empty into the McRae canal."

Drainage Studies - C. B. Gay, Fleming, Georgia.-"We succeeded in getting established plots of Coastal Bermuda Grass, Pensacola Bahia, and Sericea Lespedeza this spring. These plantings according to several observers, including Mr. Bailey, are unusually good and possibly some of the best for first year growth that have ever been seen. These plantings along with some other summer plantings in our small 1/40 acre observational plots are very encouraging and indicate that the heavy gumbo soils are good pasture soils."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Walker reports that considerable time was devoted to perfecting a method for determining the spacing of drainage laterals from soil core permeability determinations. The method is based on the assumption that, regardless of the path that hydrostatic water takes as it recedes through the soil, the resultant may be expressed in vectors along radii extended into the soil profile with the drain lateral as their origin."

Sedimentation Studies - R. Woodburn, State College, Mississippi.-"Calculations were completed early in the month on debris basin surveys for determination of sediment production rates on gullied lands. This subject is covered in a special report which is quoted below:

"On August 10, a conference was held at Arkabutla Lake with Mr. Cozzani and Mr. Kavanaugh, Vicksburg District Army Engineers. The lake had recently been drained as low as possible in a fish improvement program and a fine opportunity was afforded to examine the sediments on the bottom of the conservation pool.

"Lake Arkabutla (Coldwater River) is one of four dams on the main hill tributaries of Yazoo River. It has a drainage area of 948 square miles and was placed in service in 1941. Sediment surveys, 1947 resulted in only 597 acre-feet of deposits after 6.3 years of operation or an annual depletion of storage of 0.11 percent. These surveys were made with an echo sounder and the Army authorities were somewhat dubious of the very low rates obtained. Accordingly, they were desirous of verifying the sediment volumes by visual inspection during the period the lake was de-watered.

"At all of the points we visited during the day, there seemed to be an average depth of sediment of only about 3 inches over the conservation pool.

"Obviously, the heavy sands are going out in the tributary valleys and are not reaching to any great extent into the flood-control pool and not into the conservation pool at all.

"A question attracting continuous interest from flood control personnel in the Yazoo River watershed project is the magnitude of sediment production from all types of land use and particularly from gullied areas.

"Some early information was furnished by Woodburn[1] from studies of rates of gully wall recession in a Tallahatta formation gully 3 miles N. W. of Oxford, Miss., for the periods 1936 - 1937, 1937 - 1939, and 1939 - 1949. The rate for the last 10 years of this study was 1.94 inches (vertical measure) per year.

"Since further information on this subject was needed, it was decided that debris basins or sand traps below gullies offered opportunity to supplement the early findings. Accordingly, cross-section surveys were made in several typical basins above dams constructed in Lafayette County in June 1949.

"These basins are located near the old Taylor Road about 7 miles south of Oxford, Miss., and are in the Tallahatta formation. There is a loessial surface stratum of several feet thickness and below are found sand deposits of varying degrees of consolidation.

"In June 1951 re-surveys were made and the volume of sediment (mainly sand) was computed for each site studied.

"An accurate plane table survey was made in order to compute the actual bare sediment contributing area of the gully, the non-contributing part, such as pond surface, sand deltas, etc., and also the drainage areas contributory to the gully system.

"Table 1 shows pertinent data for the gullies studied and the sediment production rate computed from the measurements of sediment volume charged to a producing area. The most valid figure for use is considered to be the sediment production rate calculated on the basis of net gully area exclusive of pond and sand deltas.

"With the exception of #2 West which had a rate of 1.73 inches per acre of net sediment producing area per year, the rates of 2.31, 2.77, and 2.43 are in remarkably close agreement. A field check of #2 West disclosed that this gully had some areas of rock fragment surface and also some small brush temporary dams each of which caused somewhat less material to move to the pond for measurement.

"Kudzu was planted in these gullies February 1950 and re-fertilized in spring of 1951. These plantings were doing very well by June 1951. They have had little if any effect on sediment production rate prior to the spring of 1951. The measured rates may, therefore, be considered as typical of unvegetated gullies. Any measurements in the future will undoubtedly be influenced by the protective effect of the kudzu as it had just reached the stage in June 1951 that the protective influence was becoming important.

"In table 2 rainfall from June 21, 1949, to June 20, 1951, is compared with the long-time figure. The total rainfall for this period was 13.5 percent above the long-time average which would indicate that the sediment production rates reported may be somewhat above the long-time expectancies. Differences in annual rainfall from year to year do not necessarily mean differences in erosion as intensity characteristics, antecedent rainfall, etc., enter the picture. For instance, in 1949 a bare plot on a 9 percent slope at State College lost 165,740 pounds of soil with 59.01 inches of rain. In 1944 the annual rainfall was less, only 53.98 inches, while the soil loss from this plot reached the fantastic figure of 271,460 pounds. Data from other years for this plot will further verify the point.

"It may, therefore, be seen that the departure from normal rainfall for the period studied is not sufficient to justify the belief that the sediment production rates are greatly different from average. Data are not available to pursue this point with any expectation of further refinement.

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[1]Woodburn, R. science studies a gully. Soil Conservation. August 1949.

Table 1.--Sediment production rates and related data for four debris basins for period June 1949 to June 1951

Project	Total sediment	Drainage area	Total area gully rim less islands	Area pond plus deltas	Net area for sed. production	Annual sed. production	
						Inc. pond	Exc. pond
	Cu. ft.	Acres	Acres	Acres	Acres	Inches	Inches
B. Mitchell #1 East	4539	0.507	0.383	0.117	0.266	1.61	2.31
B. Mitchell #1 West	11905	1.100	.890	.298	.592	1.84	2.77
B. Mitchell #2 West	13911	3.219	1.34	.23	1.11	1.42	1.73
B. Mitchell #3 West	22548	3.99	1.58	.29	1.28	1.97	2.43

"When the 1939 to 1949 study is considered together with the four gullies reported herein, it would appear that a rate of 2 inches per year seems about right for design purposes for such sites.

Table 2.--Comparison of rainfall for period June - 1949 to June - 1951

Month	1949	Average	1950	Average	1951	Average
June 21-30	2.05	1.45				
July	2.33	4.26	5.32	4.26		
August	6.12	3.61	6.65	3.61		
September	.99	3.32	4.20	3.32		
October	7.72	2.98	1.15	2.98		
November	.71	4.54	5.49	4.54		
December	4.76	6.02	3.46	6.02		
January			11.03	5.04	9.92	5.04
February			6.45	4.22	6.07	4.22
March			7.59	5.71	7.39	5.71
April			5.96	4.88	4.14	4.88
May			3.84	4.38	2.70	4.38
June 1-20			3.77*	4.34	1.24	2.89
Total	24.68	26.18	64.91	53.30	31.46	27.12

Total rainfall for period 121.05 inches
Long-time average for same period 106.60 inches

*June 1 to 30 inc.

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"Three watersheds have been placed in operation. The areas are 15 acres, 90 acres, and 210 acres. Two more in the same vicinity are being planned. These will have areas of 530 acres, and about 2,000 acres. All watersheds are in virgin grass pasture and on the same soil type and topography. The run-off measuring devices are the existing road culverts.

"On July 15 what may be a record runoff occurred from these watersheds. The following peak rates were observed:

C1 (15 acres) - 72 c. f. s. (1)
C3 (90 acres) - 472 c. f. s. (2)
C4 (210 acres) - 326 c. f. s. (3)
C5 (530 acres) - 2,690 c. f. s. (4)

(1) Estimated peak flow through culvert. A pondage correction has not been applied.

(2) This is a good estimate. The culvert has been calibrated by models. A pondage correction has been applied.

(3) Estimated peak flow through culvert. Pondage correction has not been applied. This correction, when applied, willprobably increase this rate by 50 percent.

(4) This is a rough estimate. The capacity of the culvert was exceeded and flow 2 feet deep occurred over the roadway. The estimate is based on high water marks and a survey of the road profile.

"A good measure of the rainfall which caused these flows was not obtained. While two recording gages were in operation they apparently did not catch the maximum rain which occurred over the watersheds. The observed rainfall intensities from one gage were:

Duration	5 min	15 min	30 min	60 min	Storm 105 min.
Intensity in hr	4.44	4.20	4.10	2.86	2.10

"Just 14 hours before this storm 2.93 inches of rain were caught by this gage.

"During this storm several tornadoes were observed in the vicinity. These tornadoes may have caused non-uniform distribution of the rainfall even over a small area."

IRRIGATION AND WATER CONSERVATION DIVISION

Irrigation Studies - K. Harris and H. B. Peterson, Phoenix, Arizona.- Karl Harris reports, "measurements of water applied to and run off from a 69-acre cotton field at Beardsley were continued. To date, six irrigations averaging about 7 inches, plus a pre-irrigation, have been given this field. Total amount of water applied has been just under 6 acre-feet. Of this amount, about 38 percent has gone off as waste water. This field is receiving plenty of water at the expense of other cotton fields which have been allowed to dry up for lack of water. It is planned to continue measurements of water applications to this field for the remainder of the season, and at that time to again take Uhland core samples to determine the degree to which this field has been compacted as compared to its condition at the beginning of the season.

"Plans are being made for conducting tillage tests on various field crops and vegetables. These tests will be replicated on the University Farms at Safford, Mesa, and Yuma. In one test, winter grain will be planted with five different types of seed-bed preparation, and three different frequencies of irrigation. The five seed-bed preparations will vary from rough plowed land to a fine powdery seedbed. It is planned to compare the yield, infiltration rate and pentrometer readings on these different treatments. Also, plans have been made to plant early spring lettuce on three different types of seed-bed preparations, ranging from extremely rough plowed land to a fine powdery seed bed. Superimposed on these types of seed-bed preparation will be three different schedules for cultivation. One set will be cultivated after each irrigation, one set for weed control only, and one set will have no cultivation but will be hand-hoed for weed control. With good luck, valuable data should be obtained from these tests.

"A differential irrigation test is being started at the University Vegetable Research Farm at Tempe on winter lettuce. Three different soil-moisture levels will be maintained in conducting these tests. The high water application plots will be irrigated when the percent moisture in the soil is 75 percent of the field moisture holding capacity. The medium treatment will be irrigated when the moisture percentage is at 50 percent field moisture capacity, and the low water application treatment will be made when the moisture percentage is at 25 percent of the field moisture holding capacity. The soil moisture will be determined by soil samples. It is planned to measure the water entering these plots by means of two Parshall measuring flumes and Friez Water Storage Recorders."

Imperial Valley Drainage Investigations - H. F. Blaney, Los Angeles, California.-"A preliminary report on the results of studies conducted by the Research Office, in cooperation with the Imperial Irrigation District and Operations, Soil Conservation Service, for the period January 1950 to July 1951, was reviewed. This report presents the results of studies on the following subjects: (1) Drainage and tile systems; (2) Leaching; (3) Lenticules; (4) Artesiagraph; (5) Salton Sea evaporation; (6) East Mesa ground water; and, (7) Ground-water survey of Imperial County. It consists of 100 pages and includes 27 tables and 30 figures. Field studies on this project have been completed and individual reports on several phases of the work are being prepared for publication. George Bradshaw, Co-Project Leader of the project has transferred to Boise, Idaho, to initiate a drainage study in that vicinity."

Increased Production, Imperial Valley Resulting from Reclamation - W. W. Donnan and G. Bradshaw, Los Angeles, California.-"On a number of those farms where tile systems were installed and the saline water-logged land had been reclaimed, a study of production records for several years was made in cooperation

with the District Conservationist and local farmers. Where possible production before tiling was secured and production for succeeding years after the drainage, reclamation, and land leveling had been accomplished was determined. These records are all from farms where Soil Conservation Farm Plans were drawn up and carried out.

"Farm No. 1 of 180 acres produced 950 pounds of barley per acre in 1945. It was leveled and tiled and produced 14, 136 pounds of alfalfa per acre in 1947; 14,725 pounds of alfalfa per acre in 1948 and 1949 and 2,240 pounds of flax seed per acre in 1950.

"Farm No. 2 of 160 acres produced 2,200 pounds of barley per acre in 1947. It was leveled and tiled and produced 4,600 pounds of barley per acre in 1948, 3,300 pounds of flax seed per acre in 1949 and 3,300 pounds of flax seed per acre in 1950.

"Farm No. 3 of 160 acres was leveled, tiled, and leached in 1947. Its production increased the first year from 1,120 pounds to 3,300 pounds of flax seed per acre. This land also produced 3,538 pounds of wheat per acre in 1950.

"Farm No. 4 of 320 acres was leveled, tiled, and leached in 1947. Its production increased from 8,835 pounds of alfalfa per acre to 17,367 pounds of alfalfa per acre the first year. In 1950 it produced 18,259 pounds of alfalfa per acre.

"Farm No. 5 is a 10-acre lemon orchard. It was producing 200 boxes per acre, but after tiling it produced 275 boxes per acre.

"Farm No. 6 consisting of 80 acres out of production due to saline and water-logged condition was leveled, tiled, and leached in 1949. It produced 2,000 pounds of barley per acre in 1950.

"Farm No. 7 consisting of 35 acres was producing only 950 pounds of barley per acre; after leveling, tiling, and leaching this plot, produced 15 tons of sugarbeets per acre.

"These production increases indicate what can be done when a good program of drainage, land leveling, and reclamation is adopted. Indications are that if the land can be drained by tiles, leached of harmful saline elements, and leveled to provide good distribution of water, the increase in production will soon pay for the improvements."

Ventura County Investigations - G. M. Litz, V. S. Aronovici, and W. T. Gish, Los Angeles, Calif.-"In connection with the cooperative water-supply study of Zone 3, Ventura County, Calif., arrangements were made to secure soil-moisture samples at the rainfall penetration sampling stations, and volume weight soil samples on the two consumptive-use plots, near the end of September. Some time was spent making irrigation checks on fields of tomatoes and black-eyed beans. Soil samples were taken in sets of six holes at three locations on the plots. These soil samples were taken both before and after irrigation. Total amount of soil samples taken was 666.

"The Fox Canyon sands which are the lower member of the Los Posas formation appeared to be the only major source of water supply of deep wells. That is, wells in excess of 300 feet. As an outgrowth of a field trip, it has become quite apparent that there are two distinct problems as related to water spreading in this area. The first one is the spreading of water so that it will enter the Fox Canyon sands and eventually become available to the deep wells. The second problem deals with the shallow wells, which derive their water from the alluvial fill. Happy Camp Canyon

is still the most promising site for this type of water spreading. A series of stations were selected for soil permeability tests. These stations include three sites in the Happy Camp Canyon; two stations in the Los Posas streambed; and a station or two near the spreading grounds above Moorpark."

Upper Santa Ana River Studies - D. C. Muckel, Berkeley, California.-"Progress is being made on the final report of the Upper Santa Ana River Valley. A few changes in the original outline have been necessary to bring it into conformance with Blaney's request that the report be kept as brief as possible and to place detail information under a separate cover as 'Basic Data.' This seems to be working out very well. San Bernardino County has recently requested certain information on specific areas and the tables to be included in the 'Basic Data' show the required information. It is expected that the Basic Data will not be given as wide a distribution as the main report. However, our cooperator, San Bernardino County, has need for this information and it cannot be entirely eliminated from all distribution."

Water Spreading - San Joaquin Valley, California - D. C. Muckel, L. Schiff, and C. E. Johnson, Bakersfield, California.-"All of the tests outlined under the most recent 'program of operation' for the field test ponds have as yet not been carried out - owing partly to vacation schedules. Investigations were continued on the effect of head on infiltration, the effect apparently varying with friction and velocity (factors of porosity) other things being reasonably equal, such as particle parameter. It is planned to construct a simple tube to increase head on soil for preliminary investigations of the effect of head. For certain soils and treatments it appears that water spreading might be more economical if applied under greater heads and smaller areas. Further progress on this subject will be reported. A study was started to determine if additions of organic residues to the surface 6 inches of soil affects the organic matter content of deeper layers. Preliminary data indicate that the organic matter content of the soil to a depth of 24 inches has been increased slightly over a comparable depth in untreated soil."

Snow Surveys and Irrigation Water-Supply Forecasts - C. Rohwer, Ft. Collins, Colorado.-"From preliminary reports, water-supply forecasts for 1951 appear to be reasonably accurate except for the Colorado River at Grand Canyon and some other Colorado River tributaries, particularly the Green River. The shortage of actual flow compared to the forecast is partially due to deficient late spring and early summer precipitation. However, recent studies indicated that the main reason for the error was failure to recognize the extreme deficiency in soil moisture on the high mountain watersheds for the past two seasons.

Study of Seepage in Irrigation Channels - C. Rohwer, Ft. Collins, Colorado.-"Torrential rains the first week in August flooded the seepage rings at the Bellvue Laboratory and on the Poudre Supply Canal. However, only minor damage was done to the equipment. The interruption of the seepage record was limited to the periods when the seepage rings overflowed.

"During the tests of the permeability of the soil of the proposed North Poudre Supply Canal, it was observed that the rate varied with the time of day, with the maximum occurring in the early morning hours. Tests were made on the seepage rings in August to determine whether similar variations occurred in the seepage rates. Readings were taken at 2-hour intervals for 3 days but no apparent variation of the rate at different times during the day and night was found.

"A series of drop tests on the effect of depth on the seepage rate from the seepage rings was made during the latter part of August. Observations of the seepage rate were made at various depths from 2 inches to 24 inches. The seepage rate at the Bellvue Laboratory site decreased as the depth decreased and although the seepage rates this year are much smaller than they were last year the results follow a similar pattern. At the Poudre Supply Canal site the seepage rate is so small that the effect of depth is overshadowed by the evaporation and consequently the decrease in the seepage rate is not apparent. Correcting the seepage rate by the amount of the evaporation may make it possible to detect the effect of depth on these seepage rings.

"Tests of the plastic bag and the variable head permeameters were continued in the seepage rings at both sites. Observations were also made with the well-type permeameter in the soil near the seepage rings. These data have not been completely analyzed but they are in reasonably close agreement with the seepage rates shown by the rings.

"Seepage measurements were made on the Arthur Ditch by the inflow-outflow method. These tests show a definite gain whereas last year a loss was found in the same section of the canal. It is possible that the heavy rains this month raised the water table to the point that the seepage is into the ditch. This possibility will be investigated."

Performance Tests of Well Screens - C. Rohwer, Ft. Collins, Colorado.-"A series of tests was completed on the flow of sand through 1/8- and 1/4-inch gravel in a 6-inch plastic tube. For these tests the sand and the gravel were placed in the tube while it was filled with water. The sand was poured into the water through a 1-inch pipe to eliminate segregation of the different sizes of particles in the sand. This was not considered necessary for the gravel because of the large and more uniform size of particles. After the sand and gravel were in place they were compacted by tapping the tube. The sand and gravel were placed in the tube with the tube vertical but the tests were made with the tube horizontal. This method worked satisfactorily and there was very little air trapped in the sand and the gravel.

"Tests of the flow through the sand and gravel packed in this manner disclosed that the head available was not sufficient to produce the maximum flows desired. It was first thought that this might be due to greater compaction of the sand in the model but a new analysis of the problem by Mr. Leatherwood indicated that the difficulty might be caused by an error in the assumed scale ratio of the model. The original computation was based on the ratio of the area of the well screen in the model to that in the prototype. However, the new analysis showed that, since the major interference to the flow occurred in the sand it would be necessary to consider the interface between the sand and the gravel in computing the scale ratio. On this basis much smaller flows will be required, the minimum being about 1/2 gallon per minute."

Irrigation Studies - C. E. Houston, Reno, Nevada.-"Two days were spent with Bureau of Reclamation personnel from Salt Lake and Fallon in reviewing their consumptive-use material on the Upper Carson Valley. One day was spent in the office and 1 day in the field. They are working on a preliminary project plan for storage and drainage for the Upper Carson Valley. The preliminary report is to be completed with a minimum of field work. Should the project be approved a detailed report will be prepared. We suggested that the Blaney - Criddle formula be used as a check for the preliminary report, but that soil moisture and tank work be undertaken for the more detailed study on consumptive use.

"Beginning in 1947 the 800-acre ranch of D. G. Vedder in Paradise Valley, Nevada, was partially broken out of sagebrush, leveled, and an irrigation system laid out with the help of the local SCS technicians. Irrigation water is obtained by pumping from ground water. The fields were well laid out according to the best SCS specifications for the conditions encountered. The border method of irrigation was used. This consisted of laying the field out on a 1/10 of 1 percent slope in strips 600 feet long by 40 feet wide, surrounded by dikes. Last month C. E. Houston, SCS, Research at Reno, and H. T. Rossolo, D. Bagley, and V. Link of the SCS Operations at Elko, Nevada, ran a series of field trials and irrigation evaluations. We found that by applying the total irrigation stream to three borders at one time instead of five as the irrigator was doing, he would not only irrigate adequately but could irrigate the land in one-half the time and with one-half the water. On an annual basis this saving in the cost of pumping water alone would amount to nearly $3,000 plus a substantial saving in irrigation labor, or many times the cost of running the irrigation trials.

"This is a good, but by no means isolated, example of how the SCS has made an excellent irrigation system lay-out and the rancher has done an excellent job of carrying out the plan up to the point of irrigation, then, with the application of water to the land, the original purpose of preparing for conservation irrigation was defeated. Is it not just as important to operate an irrigation plan correctly as it is to construct it correctly? The best operation of the plan may also require technical assistance."

Irrigation Studies - P. E. Ross, Weslaco, Texas.-"At the present time harvest yields from the seven irrigation application efficiency plots show the greatest yield on the plot which had a grade of 0.02 foot fall per 100 feet. The lowest yield was from the plot which was graded to 0.30 foot fall per 100 feet. The range of grade in the experiment was 0.05 percent to 0.50 percent.

"In the moisture level and spacing studies the highest yield was obtained from the plot where we maintained a medium moisture level. The moisture levels maintained in this experiment was 75 percent field capacity for the high level, 50 percent for the medium level, and 25 percent for the low moisture level. One replicate of non-irrigated plots used only the rainfall during the growing season. The spacing tests superimposed on the moisture-level studies were 6, 12, and 18 inches between single cotton stalks in each row. Data show the 6-inch spacing yield slightly higher than the 12-inch spacing which in turn had a higher yield than the 18-inch spacing.

"The flow from drain tile on the outlying Martin drainge project was reduced from 60 gallons per minute on June 16 to 6 gallons per minute on July 16, and to zero flow on August 16. The water table continues to recede and a check at the end of August shows the table to be lower than at any time since the study was initiated. A very excellent crop of cotton was harvested from this field while fields on the North, South, East, and West of the field varied from no production in spots to only fair production. Since the boundary lines of production are so definitely drawn around the field it is obvious that much of the reclamation of this land is due to land-management practices initiated when the project was started. The lowering of the water table this summer has been primarily due to use of excess irrigation water by the heavy cotton crop and better irrigation practices. We believe this substantiates the conclusions that were drawn after the first year's observation, i. e. the primary cause of the high water table and soil salinity was brought about by the landowner through misuse of irrigation water on his own land."

Irrigation Studies - N. P. Swanson, Amarillo, Texas.-"A second 4-inch irrigation was made on grain sorghum plots August 13. Very distinct differences in growth could be observed on the three different irrigation treatments of grain sorghum at the end of the month. Irrigation has delayed maturity and has increased both stalk and head development. The plots with no irrigation since planting had practically exhausted the available moisture in the surface 4 feet of soil at the end of August and had used little stored moisture (rainfall excepted) from the surface 2 feet after the first week of the month. A 1.19-inch rain on August 26 failed to increase soil moistures at depths of 8 inches below the surface on these dry plots. The last irrigation replenished moisture into the third foot of the twice-irrigated plots and little or no moisture was used from the fourth foot on these plots following the second irrigation. The first opportunity to irrigate plots which had been subtilled following wheat was obtained during August. Applications of 4.5 inches were made with infiltration rates approaching 1 inch per hour for the first 2 hours. Differences in amounts of residue did not appear significant in relation to the infiltration rates on these plots. Infiltration was generally complete within 6 hours after application of the water. Residues were not a problem in irrigating these level, bordered plots and there was no movement of residue with the irrigation water despite an unfavorable wind."

Wheat Yield - S. J. Mech, Prosser, Washington.-"Results for 1951 wheat plots are shown below. The variety was Marfed, sown on March 16. Information on the head and kernel number and size is being prepared.

Nominal designation	Number of Irrigations	Yield		Ratio
		Grain Bu./A.	Straw T/A	Grain/Straw
Wet	4	65.2	3.24	0.60
Medium	2	67.4	3.22	.63
Dry	1	51.9	2.10	.74

"There is no significant difference between the wet and the medium plots. That between the dry and either the wet or the medium is highly significant.

"The dry plots were irrigated only once - June 2. The wheat was well headed out at that time. The medium plots were irrigated on May 2 and June 13. The wet ones received water four times - April 17, May 17, June 7, and June 21. On July 10, when the wheat was about mature, the available soil-moisture content was 15 percent, 25 percent, and 50 percent on the dry, medium, and wet plots respectively.

"The moisture at planting time was 50 percent of that between field capacity and wilting point. A total of 2.28 inches of precipitation fell during the growing season. April, May, June, and July had 0.36, 0.57, 1.19, and 0.16 inches of rain respectively."

Irrigation Studies - E. W. Cowley, Grand Junction, Colorado.-"During August routine work on measurements and observations were continued. It was observed that the water table in parts of the project area is gradually rising. One of the observation wells that taps the underlying gravel formation has started to flow at the ground surface. This well is on the bank of a drain ditch. The bottom of the well is about 25 feet below the bottom of the ditch and the top of the well pipe is about 16 inches above the ground surface.

"The pump for the drainage project which was expected about August 10 was not delivered until the 25th. The pump is now being installed.

"The plan at present is to initate a continuous pumping test about September 4 or 5."

Irrigation Studies - H. K. Rouse, Gunnison, Colorado.-"The entire month was devoted to the factorial experiment on the Blackstock Experimental Area. This culminated on August 28, 29, and 30 with the late hay harvest and the harvest of the aftermath grass which had grown since the early harvest on July 11 and 12. Several weeks will be required before the dry weights of the harvest from these 512 small plots are available and still more time before analyses for crude protein and phosphorous are completed. However, visual inspection indicates certain interesting developments.

"During the 1951 season, in contrast to the conditions anticipated and experienced during the first (1950) year of the experiment, the water table remained high and the soil sub-irrigated to such an extent that there was no appreciable difference in the surface water application for the three intermittent irrigation practices, the times for which depend on the soil-moisture tension as indicated by tensiometers. Apparently, after the surface was once thoroughly wet, contact was established with the ground water and the evapo-transpiration requirement was supplied by capillarity. Consequently, for this season, the comparisons in irrigation practices seem to be continuous irrigation versus sub-irrigation.

"From the visual inspections, there does not appear to be any large difference in the tonnage yield in the late harvest as between the two practices. There does appear to be a difference in quality of the hay. The hay produced under continuous irrigation has a yellowish tinge, associated with nitrogen deficiency. The sub-irrigated hay is green to dark green depending on the fertility treatment. A significant difference in the crude protein yield is indicated. There appears to be a large difference in yield of the aftermath growth as between the two irrigation practices. The aftermath growth on the sub-irrigated plots appears to be at least twice as great as on the continuously irrigated plots. Moreover, there did not appear to be very much difference in the aftermath growth as between the fertility sub-plots under continuous irrigation, or any appreciable response to the legume seeding. In fact, most of the original stand of alsike clover seemed to have disappeared under this treatment and the rushes and sedges to have increased. These observations suggest that the nitrogen fertilizers had been almost completely removed by the large quantity of water - from 180 inches to 340 inches for the four replications - passing through the soils of continuously irrigated plots. This phenomenon seems to have occurred in spite of the fact that one-half of the nitrogen was applied early, on April 13 and 14 and the second half not applied until June 4 and 5.

"It will be recalled that one-half of each of the 16 major plots was seeded to a legume mixture consisting of alsike clover, mammoth red clover and birdsfoot trefoil at the beginning of the experiment, in April 1950. At the end of the first season there did not appear to be any response to this seeding. At the time of late harvest in 1951 there seems to be a very definite response in the sub-irrigated plots. The birdsfoot trefoil does not seem to have responded since not a single plant has been observed. The response to alsike clover seeding is not clear because there was an appreciable stand of alsike in the native sod prior to seeding. The response to mammoth red clover has been good. Where there was none of this plant originally, some sub-plots are dominated by it at this harvest.

"It was noticed that the growth of the clovers was great in the aftermath. In some instances, especially where the fertility treatment consisted of 200 lb. per acre of phosphoric acid with no nitrogen and in the check plots which have no fertility treatment, the clover growth completedly overshadowed the grasses and the green weight of the aftermath approached that of the late harvest on the adjacent half of the plot.

"It is not yet clear whether the response to nitrogen fertilizer is as great proportionately, this year as last. In general, the yields of the nitrogen treated plots appear to be fully as great as in 1950 but the yields of the check plots seem to be somewhat greater.

"The response to the phosphorous treatment, without any nitrogen, in 1950 was moderate, the increase in yield over the check plots amounting to but 10 percent. The indications are that in 1951, the increase in yield of these plots will be greater, proportionately, in spite of improvement in the yield of the check plots. The effect of the phosphorous is residual since no additional phosphorous was applied in 1951.

"The effect of the variable amounts of nitrogen does not seem as pronounced as in 1950. This is a border line observation and it will be no surprise if the final weights do not support it. It seems evident that the 40 pound per acre application of nitrogen stimulates growth of grasses at the expense of clovers, but a good stand of clover remains. With the 80 pound per acre application, the stand of clover is further diminished and at the 160 pound per acre level, clovers are generally absent. No appreciable stand of clover occurs when amounts of phosphoric acid up to 400 pounds per acre are used in connection with 160 pound per acre of nitrogen. With this amount of nitrogen, the growth of grasses is stimulated to such extent that the legumes are crowded out.

"A study of the fluctuations of the water table began with completion of a net of piezometers on June 6. A preliminary examination of portions of the data seems to indicate that seepage from the Blackstock Ditch is minor and has no appreciable effect on the water table. Early in the season there appeared to be some movement of water through the substratum (which lies well below the bottom of the Ditch) from the area above. The piezometer network was not completed early enough to justify conclusions as to whether this movement was a general water movement throug the Willow Creek fan influenced by melting snow in the mountains or was due to irrigation of portions of the ranch above the Blackstock Ditch and irrigated by diversions from Willow Creek. It seems certain that after July 15, the major factor influencing the water table under the experimental area was irrigation of the continuous plots, with some border effects due to irrigation of those portions of the ranch to the east and west of the experimental area."